

# ROAD TRAFFIC EXTERNALITIES INDICATOR BASED ON EXTERNAL COSTS OF TRANSPORT

**Mariana Vilaça; Carlos Sampaio; Jorge Bandeira; Paulo Fernandes; Margarida C. Coelho**

Centre for Mechanical Technology and Automation (TEMA), Department of Mechanical Engineering, University of Aveiro, Portugal,  
{mvilaca; c.sampaio; jorgebandeira; paulo.fernandes; margarida.coelho}@ua.pt

**Vera Rodrigues; Hélder Relvas; Carlos Borrego**

Centre for Environmental and Marine Studies (CESAM), Department of Environment and Planning, University of Aveiro, Portugal,  
{vera.rodrigues; helder.relvas; cborrego}@ua.pt

## Published Paper along 2018

Sustainable mobility is a widely promoted concept. In recent years, intelligent transportation systems aims to reduce the negative environmental, social and economic impact of transport and improve the quality of life. Intelligent vehicle routing systems is one of this system that intends to reduce traffic congestion, energy consumption, emissions and optimize the use of road infrastructure. However, sustainability and smart mobility are also related with health conditions, safety and social cohesion.

The main goal of this paper is to propose a methodology that integrates road traffic externalities into a single sustainability indicator, adjusted to local contexts of vulnerability. Levels of traffic congestion, traffic emissions, health impact of traffic-related PM10 exposure, traffic noise and probability of road accidents are the variables considered in this methodology. The main contribution of this work is to assess the social and economic value of health and safety as well as the environmental impact of transport activities.

The developed methodology was tested and every variable was determined in an urban road link in Aveiro, Portugal. Road accidents represented 32% of the total costs followed by traffic noise and traffic emissions with 26% and 23%, respectively. Levels of traffic congestion and health impact of traffic-related PM10 exposure are the variables with less impact with 14% and 5% of the total costs.

The methodology developed on this paper allows to build a link-based sustainable indicator, which can be updated in real-time through a set of information sources and translated into a cost factor. The methodology can be straightforwardly applied into advanced traffic management systems, specifically intelligent vehicle routing system or intelligent road pricing system.

**KEYWORDS:** road traffic externalities; indicator; external costs

**ACKNOWLEDGEMENTS:** The authors acknowledge the following projects: @CRUISE (PTDC/EMS-TRA/0383/2014), funded within Project 9471 – Reforçar a Investigação, o Desenvolvimento Tecnológico e a Inovação (Project 9471 – RIDTI) and supported by European Community Fund FEDER; MobiWise(P2020 SAICTPAC/0011/2015), co-funded by COMPETE2020; CISMOB (PGI01611, funded by Interreg Europe Programme); TEMA UID/EMS/00481/2013-FCT; CENTRO-01-0145-FEDER-022083; Portugal2020 – Operational Program for Competitiveness and Internationalization; European Union's ERDF and FCT. J.Bandeira acknowledges the support of FCT for the Scholarship SFRH/BPD/100703/2014. C. Sampaio acknowledges the support of FCT for the Scholarship SFRH/BD/138746/2018.